

# Eastex Environmental Laboratory

June 2014 Newsletter

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## Ok, Everyone says I must look under the microscope at my Biomass and floc structures. What exactly am I looking for?

Here is a little basic information. A wastewater treatment plant is basically a bug factory. You are growing bacteria to clean the water. 90% of all the work that goes on in the secondary portion- i.e. the biological stage is the growth of a biomass to degrade organics and remove pollution is performed by single celled bacteria. The bacteria are the workhorses but difficult to identify under a microscope. The higher life forms indicate the health and types of bacteria present. The 3 general types are listed below.

**Ok, well that is great so what am I really looking at?** Bacteria can be single celled, floc forming or filamentous. All three types will degrade organics. Which type is the best for my system?

**Single celled bacteria** also provide a food source for higher life forms. Single celled bacteria can cause TSS problems though and will not settle out very well. They can increase polymer consumption.

**Filamentous Bacteria** are bacteria that grow in long thread-like strands or colonies. Some of the positive attributes of filaments are that they are very good BOD removers. They add a backbone or rigid support network to the floc structure. They help the floc structure to filter out fine particulate matter that will improve clarifier efficiency. They help the floc to settle in small amounts. Some of the negative aspects are that they can interfere with separation and compaction of activated sludge and cause bulking when predominant. They can affect the sludge volume index (SVI) and they can cause poor settling if dominant.

**Floc forming bacteria** are usually desired. Floc is a collection of smaller particles agglomerating into larger particles containing particulate matter, debris, bacteria and Bio-polymers. Some of the positive aspects of floc forming

bacteria is that they settle out easily as solids, reduce the need for polymers in clarifiers and reduce consumption in dewatering applications. Some of the negative aspects are they can be hard to dewater if they have a high polysaccharide coating. They also can form very small pin floc if older or straggler floc if young which can contribute to TSS problems.

Source for this newsletter: Environmental Leverage

## We Started this month with a new mystery Bug Of The Month



Can you guess what this is? Hint: They are found in various types of water, including freshwater and wastewater. They feed on the bacteria and thus help to clarify the effluent. These can be found during most sludge ages but are dominant during the middle sludge ages. *See answer on the back.*

**Ask Eastex Lab to perform microscopic analyses.** Some of the things typically checked for visually and monitored by qualitative and quantitative observations: Floc size, floc color and clarity of water among floc, floc structure and filamentation presence, and micro-organism diversity.

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**Floc Structures and Filaments** Because every wastewater plant has a different bacterial population composing its biomass, a different type of influent, different pieces of equipment and different climates, the MLSS may have different floc structures. What may be considered good floc structures in one system may be poor floc structures in another wastewater treatment plant. Nonetheless, some characteristics can be examined to determine relative floc condition. Generally, the more firm and compact a floc is, the better it will settle. The more lacy and dispersed a floc is, the less likely it will be to settle. The presence or absence of pin or straggler floc, which can be responsible for high-suspended solids (TSS) in wastewater, is also an important observation when examining floc structure. The presence of many filamentous bacteria is also examined to determine if filamentous bulking is responsible for poor settling.

**Ok now we are on to the Floc Structure part.** Is the Floc firm or compact? What does that mean? Is the floc going to stay together or will it shear easily due to flow, pumping or turbulence? Firm, well rounded, compact floc with clear water between particles? Are there lots of single celled bacteria or little floc structures that can cause TSS problems?

Some of the terms you will hear- Weak, Lacy, Open, Diffuse, Compact, Firm, Rounded

Is it lacy, open, diffuse or irregular? What do these terms look like and what do they indicate? Obviously lacy and open will resemble a doily similar to what your grandma used to have. The more open the floc is, the harder it will be to settle or dewater.

**Floc Color** is important also. It indicates the age of the biomass. Clear indicates a very young biomass. Golden brown indicated a healthy floc. Black indicates the floc is turn-

ing anaerobic and running out of air or is older. Sometimes floc can be colored if the influent contains dyes. Usually this does not impact anything unless there are heavy metals or toxic compounds that will not pass a leach test when disposing of the solids.

Some Water Quality Indicators	
Stalked ciliates	Fair to good water quality
Bristle worms	Healthy diverse population but excessive amount indicates old sludge.
Rotifiers	Good water quality indicator
Crawling ciliates	Typically good water quality. Indicator for ammonia. The lower the ammonia, better they live.
Free swimmers	Variety of water quality conditions but Coleps is an indicator of good water quality.

Source for this newsletter: Environmental Leverage

### Coming Soon

Nutrients being added to State's implementation plan. TCEQ to revise the Nutrient Criteria Developmental Plan to include all reservoirs and some estuaries in 2017.

We will provide you with more information in the next newsletter about this topic and about Permit changes to include nutrients.

### Field Supervisor

Chris Wirzberg 936-653-3249

### Field Techs Contact

Brian Sewell 936-827-3377

Wendy Willson 936-828-7209

Dale Landrum 936-828-7205

Christopher Guinn 936-827-3378

Shawn Arnold 936-828-7208

Mark Bourgeois 936-828-7206

Lulia Galusha 936-828-7203

Cassie Tarron 936 -788-4193

## Floc Vocabulary aka Flocabulary

Floc Structures	Is floc going to stay together or will it shear easily?
Lacy or Semi-compact	The more open the floc the harder it will be to settle or dewater
Compact	More firm and compact the better it will settle
Floc color	It indicates age of the biomass
Clear	Indicates very young biomass
Golden brown	Healthy floc
Black	Floc is turning anaerobic and running out of air or is older



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Answer: **Crawling Ciliate**